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ABSTRACT

This paper is based on data collected from New York City's Computer Pilot Program, an on-going investigation of the use of comprehensive computer based instruction (CBI) programs in the basic skills remediation of educationally disadvantaged students in grades 3-12. The findings suggest that the use of comprehensive CBI is altering the ways in which teachers teach and students learn: (1) CBI classrooms were more student-centered and cooperative than regular classroom environments; (2) teachers were more the facilitators of learning and learning was more individualized when computers were involved; and (3) students were more motivated and less threatened when learning on computers than when learning in regular classrooms. (Author/DB)

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TEACHING AND LEARNING WITH COMPUTER-BASED INSTRUCTION

by

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TEACHING AND LEARNING WITH COMPUTER-BASED INSTRUCTION

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ABSTRACT

Drawn from data collected from New York City's Computer Pilot Program, a on-going investigation of the use of comprehensive CBI programs in the basic skills remediation of educationally disadvantaged students, our findings suggest that the use of comprehensive CBI is altering the ways in which teachers teach and students learn. We found that CBI classrooms were more student-centered and cooperative than regular classroom environments, that teachers were more the facilitators of learning and learning was more individualized when computers were involved, and that students were more motivated and less threatened when learning on computers than when learning in regular classrooms.

INTRODUCTION

Since 1985, the number of computers in American public schools has doubled to 1.7 million or about 1 computer for every 25 students. The oldest, the most widely employed, and the best researched form such computer usage has taken is computer-based instruction (CBI). A good deal of research has been done which suggests that students learn as well or better when the material to be learned is presented via computer (ref 1-4), but despite much reported anecdotal evidence which suggests that computer-based learning is more individualized, more student-centered, and more cooperative than regular classroom learning (ref 4-8), little empirical research has concerned itself with such matters.

METHODOLOGY

The Computer Pilot Program is an on-going project of the Division of Computer Information Services of the New York City Board of Education. Its goals are to identify comprehensive CBI programs which can be effective in increasing the academic performance, attendance, and positive attitudes of educationally disadvantaged students in grades 3 through 12, and to isolate implementation factors significantly influencing program and/or implementation effectiveness (ref 4). During the 1987/88 and 1988/89 school years, 14 comprehensive CBI programs -- Autoskills, CCC, CCP, CNS, Degem, ESC, Ideal, New Century, PALS, PC Class, Plato, Prescription Learning, Wasatch, and Wicat were evaluated in 12 elementary, 8 intermediate, and 12 high schools throughout New York City. Students' spring citywide test scores from the year preceding their participation in the Computer Pilot Program were compared with their scores from the year of their program participation using several statistical analyses to assess achievement gains resulting from CBI use. Tests used were the Degrees of Reading Power (DRP) for reading achievement and the Metropolitan Achievement Test (MAT) for mathematics performance.

In the spring of 1989, we interviewed a sample of students and teachers at each school participating in the Computer Pilot Program for that school year. Open-ended interviews were conducted with whole classes of students participating in the program to determine students' responses to it. In addition, students were asked to individually complete two written questionnaires. The first of these was designed to corroborate and quantify information gained in the open-ended interviews. The second was designed to assess student perceptions of the social context of the computer room. Teachers were interviewed individually and likewise given two questionnaires to complete on their own. Responses to each question were tabulated and the percentage responding with each choice calculated.

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In addition, observations of students and teachers using CBI were conducted in each participating school, and the same students were observed during regular classroom activities. Observations lasted fifteen minutes at a time, and consisted of the recording of all student-teacher interactions occurring during that period. These were characterized as either student-initiated or teacher-initiated, whole group or individual. The total number of interactions in each category was tabulated and used to calculate ratios of teacher-initiated to student-initiated and whole group to individual interactions for both CBI and regular classroom instruction, and the significance of differences between computer-based and regular classrooms assessed using a chi-square analysis. The total numbers of student-student interactions occurring in each environment were also recorded.

RESULTS

The results of our analyses of student achievement scores have been reported elsewhere (ref 4). They indicate that involvement with CBI programs resulted in increases in the academic performance of the students we tested; that students' reading achievement gains were approximately equal to their mathematics achievement gains; and that an inverse relationship existed between students' instructional level and their achievement gains resulting from CBI use.

The results of our analysis of student and teacher questionnaires indicate that the majority of students believed they were more in control of their own learning when learning on computers, and that the majority of teachers believed that they gave students more individual attention and were more aware of individual student's performance in computer-based classrooms. We found that the majority of both students and teachers believed that learning on computers was less threatening and more interesting than regular classroom learning, and that discipline was less of a problem and students better understood the material presented during computer-based learning.

The chi-square analysis of student-teacher interactions revealed significant differences between regular and computer-based classrooms in the numbers of student-initiated interactions. The quality of these differences is indicated by the ratios of the various kinds of interactions found in differing classroom environments.

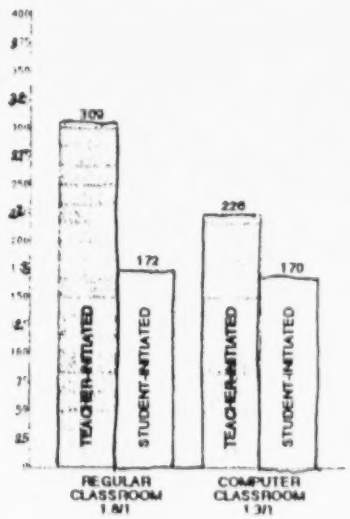

FIGURE 1
RATIO OF TEACHER-INITIATED TO STUDENT-INITIATED INTERACTIONS IN REGULAR AND COMPUTER CLASSROOMS

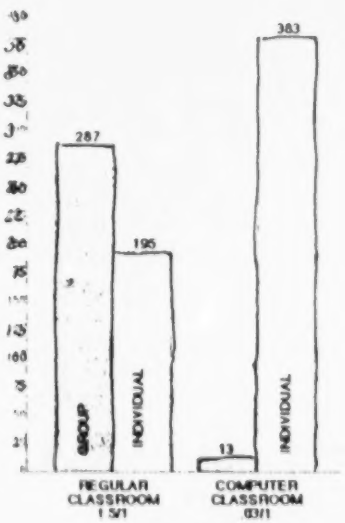

FIGURE 2
RATIO OF GROUP TO INDIVIDUAL INTERACTIONS IN REGULAR AND COMPUTER CLASSROOMS

The ratio of teacher-/student-initiation was 1.8/1 in regular classrooms and 1.3/1 in computer rooms (Figure 1). The results indicate that although the numbers of student-initiated interactions were almost identical during regular and computer-based instruction, there were many more teacher-initiated interactions in regular classrooms. The ratio of whole group/individual interactions was 1.5/1 in regular classrooms and .03/1 in computer rooms (Figure 2). These results show that while the majority of interactions in regular classroom instruction were whole group, the overwhelming majority of interactions occurring during CBI were individual.

The total number of student-student interactions observedwas 44 in regular classrooms, and 73 in computer rooms. These results indicate that more cooperative learning took place in the computer rooms we observed.

CONCLUSIONS

We found that the majority of students believed they were more in control of their own learning when learning on computers, and that the majority of teachers we interviewed believed that they gave students more individual attention and were more aware of individual student's performance in computer classrooms than in regular classroom settings. Such findings corroborate those of our open-ended interviews and suggest that computing environments we visited were more supportive of individualized and student-centered learning than regular classrooms in those schools. The data collected in classroom observations likewise suggest that computer-based learning was more individualized and student-centered than regular classroom learning. We found that the majority of both students and teachers believed that learning on computers was less threatening and more interesting than regular classroom learning, and that discipline was less of a problem and students better understood the material presented during computer-based learning. These results again corroborate those of our open-ended interviews, and suggest that the students involved in the Computer Pilot Program were less threatened and more motivated by computer-based learning. Finally, we observed nearly twice as much cooperative learning taking place among students involved with CBI as taking place among the same students involved in regular classroom instruction. Such finding suggests that the environments of the computer rooms we visited were more cooperative than those found in regular classrooms in the same schools.

Our results indicate that within New York City's Computer Pilot Program, the use of comprehensive CBI is creating learning environments which are more student-centered and cooperative, where teachers are more the facilitators of learning and learning is more individualized, and in which students are less threatened, more motivated, and have greater perceived control over their own learning. Our findings linking increased academic performance to students' participation in the program, suggest that such changes were in some sense supportive of learning, at least among the educationally disadvantaged student population involved. Whether such findings are generalizable to other populations and/or other programs remains to be seen. For the present, however, they at least argue for further investigation of educational computing environments, as well as further investigation of the particular features of such environments.

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